

Abstracts of Current Aviation Medicine Literature

I. ACCELERATION PHYSIOLOGY

1. **Heart biochemical responses 14 days after +Gz acceleration.** R T DOWELL, L A SONDAHI, J N LINDSEY and H L STONE, *Aviation Space and Environmental Medicine*, Vol. 47, Nov. 1976, P. 1171-1173, 19 Refs.

Myocardial biochemical responses were measured in miniature swine following +Gz stress. Unanesthetized animals were subjected to an acceleration profile encompassing 3,5,7,9, and 11 +Gz. Acceleration exposure time at each G level varied from 60-120s. At 14 d after +Gz exposure, free lysosomal enzyme activity was reduced by 15-40% in both the epicardial and endocardial portions of the left ventricle, while sequestered enzyme activity remained near control levels. Since free lysosomal enzyme activity was previously found to be elevated approximately two-fold in response to a single 9+Gz exposure, the responses observed 14 d after +Gz acceleration would be consistent with a myocardial damage-repair phenomenon. The DNA levels in the left ventricle of +Gz stressed animals were significantly lower than control values, while the RNA/DNA ratio was markedly elevated. The nucleic acid results imply a metabolic hyperfunction of the remaining nuclear material.

2. **Effects of lower body negative pressure (LBNP) on the distribution of body fluids.** A. FOUX, R SELIKTAR and A VALERO, *Journal of Applied Physiology*, Vol. 41, Nov. 1976, P. 719-726, 9 Refs.

Reduction of pressure on the lower part of the human body is believed to be capable of altering the normal fluid distribution. This could serve as a therapeutic method for emergency relief of the effect of hypertension, or it could be used as counterbalance for zero gravity and assist in preparing astronauts for reentry into the gravitational field. The present work describes a technique of assessment of the fluid

shift caused by such pressure reduction. Thirty experiments were performed on four healthy subjects. The shift of fluid was assessed by measuring changes in body weight distribution of the tested subjects. The experimental results show that two processes may have taken place within the human body: shift of blood within the vascular system and diffusion of fluids from the circulatory system to the tissues. The total fluid shift ranges between 1 and 2 kg. It was proportional to the pressure gradient and exponential with time. The systolic blood pressure was reduced with the pressure reduction while the pulse rate increased.

II. ENVIRONMENTAL PHYSIOLOGY

3. **Alterations in the coronary circulation of man following ascent to 3,100 m altitude.** ROBERT F GROVER, ROBERTO LUFSCHANOWSKI and JAMES K ALEXANDER, *Journal of Applied Physiology*, Vol. 41, Dec. 1976, P. 832-838, 27 Refs.

Alterations in coronary blood flow associated with adaptation to high altitude were examined. Three normal men native to low altitude were studied, first at sea level, and again after 10 days' sojourn at 3,100 m altitude. During rest at high altitude, a 32% decrease in coronary blood flow was largely offset by a 28% increase in coronary arterial O_2 extraction to maintain myocardial O_2 delivery. The increase in O_2 extraction resulted mainly from a decrease in coronary sinus blood O_2 content and saturation. However, coronary sinus O_2 tension remained constant, implying a decrease in the affinity of hemoglobin for O_2 . These observations are consistent with the hypothesis that coronary blood flow is regulated to maintain constant myocardial tissue O_2 tension (as reflected here by coronary sinus blood O_2 tension.) The absence of a decrease in coronary sinus O_2 tension or a decrease in myocardial lactate extraction imply that myocardial hypoxia did not develop. Therefore, myocardial hypoxia is not

the basis for the decrease in cardiac stroke volume at high altitude reported previously and also observed in the present study.

4. **Urinary catecholamine excretion on acute induction to high altitude (3,658 m).** RAGHUNATH SINGH HOON, SUBHASH CHANDER SHARMA, V. BALASUBRAMANIAN, KANWAR S. CHADHA and OOMMAN P. MATHEW, *Journal of Applied Physiology*, Vol. 41, Nov. 1976, P. 631-633, 10 Refs.

Fifty healthy male volunteers, 22-34 years of age, normally resident at altitudes less than 1,000 m, were airlifted to 3,658 m. Urinary excretion of catecholamines was measured at sea level (198 m) and on the 1st, 2nd, 4th and 10th day of a stay at high altitude. The symptoms observed on exposure to high altitude were assigned arbitrary scores. The volunteers could on this basis, be divided into "symptomatic" and "asymptomatic" groups. The two groups showed a markedly different pattern of urinary catecholamines excretion on exposure to high altitude and on return to sea level. Significant increase in the catecholamine excretion was observed in the symptomatic group only. A possible role for enhanced sympathoadrenal activity in the etiopathogenesis of high-altitude illness is postulated.

5. **The incidence, importance and prophylaxis of acute mountain sickness.** PETER H. HACKETT, DRUMMOND RENNIE, HARRY D. LEVINE, *The Lancet*, Vol. II, Nov. 1976, P. 1149-1154, 13 Refs.

Acute mountain sickness (A.M.S.) and its severe complications, high altitude pulmonary oedema (H.A.P.O.) and cerebral oedema (C.O.), were studied in 278 unacclimatised hikers at 4243 m altitude at Pheriche in the Himalayas of Nepal. The overall incidence of A.M.S. was 53%, the incidence being increased in the young and in those who flew to 2800 m, climbed fast, and spent fewer nights acclimatising enroute. It was unrelated to sex, to previous altitude experience, to the load carried, and to recent respiratory infections. The severity of A.M.S. was inversely related to age (independent of rate of ascent) and the highest altitude attained, and was highly correlated with speed of ascent. There were 7 cases of H.A.P.O. and 5 with the more intractable C.O. and, of these

12, 11 had flown in, 9 had spent only one night at Pheriche, and none were on acetazolamide. 11 required evacuation. Acetazolamide, compared in a double-blind study with a placebo and also compared with no tablets at all, reduced both the incidence and the severity of A.M.S. in those who flew to 2800 m but not in those who hiked up to that altitude. Prevention consists in slow ascent, rapid recognition of warning signs, and prompt descent to avoid progression.

6. **Mountain sickness, retinal haemorrhages, and acclimatisation on Mount Everest in 1975.** CHARLES CLARKE, JIM DUFF, *British Medical Journal*, 28 Aug. 1976, P. 495-503, 7 Refs.

During the 1975 British Everest Expedition, which made the first ascent of the south-west face, observations were made in relation to mountain sickness and the appearance of retinal changes. Two sherpas with cerebral oedema, one Briton with pulmonary oedema were treated, Retinal haemorrhages occurred in four out of six Britons who were newcomers to altitudes over 6000 m (19,685 ft) but in only two out of 14 Britons who had previously visited these altitudes. Intraocular pressures during ascent to 6000 m were within normal limits. The relevance of the ocular findings to acclimatisation in previous years was examined, the results supporting the hypothesis of a "carry-over" effect from previous visits to high altitude.

7. **Protection of airline flight attendants from hypoxia following rapid decompression.** DOUGLAS E. BUSBY, ARNOLD HIGGINS and GORDON E. FUNKHOUSER, *Aviation Space and Environmental Medicine*, Vol. 47, Sept. 1976, P. 942-944, 2 Refs.

To determine the maximum time for working flight attendants to effectively initiate airline passenger mask donning after onset of a rapid, severe decompression, we exposed 10 subjects in two series of tests to a decompression from 6,500 to 34,000 ft (2,000 to 10,400 m) in 26 s, followed by descent at 5,000 ft/min (1,500 m/min) while subjects performed a light-to-moderate workload. Supplemental oxygen was provided in one series from a compressed oxygen system, and in the other series from a chemical oxygen generator system. With delays to

mask donning of 10 and 15 s, no hypoxic effects occurred. With delays of 20 and 25 s, increasing hypoxic effects, similar in frequency for the two systems occurred. Some technical problems in mask donning contributed to losses of consciousness with the latter two delays.

8. **Safe level for noise exposure?** BARBARA A BOHNE, *The Annals of Otolaryngology & Laryngology*, Vol. 85, Nov-Dec. 1976, P. 711-721, 16 Refs.

The safety of long, continuous exposure to several different levels of noise was determined. Chinchillas were exposed for two to nine days to an octave band of noise with a centre frequency of .5 kHz or 4 kHz. By examining the inner ear for evidence of acute cellular degeneration exposures which produced minimal permanent damage could be identified easily. Differences were found between the two bands of noise in the level required to produce injury, and the type, location and extent of damage which occurred as the level was increased. The findings help explain why exposure to industrial noise, which is generally low frequency, first produces measurable auditory changes for high frequency tones.

9. **Comparison of the subjective intensity of sinusoidal, multifrequency, and random whole-body vibration.** RICHARD W. SHOENBERGER, *Aviation Space and Environmental Medicine*, Vol. 47 Aug 1976, P.856 - 862, 7 Refs.

An intensity matching technique was used in two experiments to test the independent component method for evaluating complex vibration environments, recommended by current vibration standards. In the first experiment, seated subjects adjusted the intensity of a 25 Hz sinusoid to match the subjective intensity of 11, 17, 40 and 63 Hz sinusoid, presented either singly or in combinations of two, three or four frequencies. In the second experiment, 25 Hz was again used to match the subjective intensity of third-octave bands of random vibration with center frequencies of 16,20,25,31.5 and 40 Hz, presented either singly or in combinations of two, three or four bands. The results showed that the acceleration of the matching response increased significantly as the number of sinusoids or third-octave bands in the stimulus increased. The findings indicate that the independent component evaluation method will underestimate the severity of complex

vibration environments, and suggest that their perceived intensities may be more accurately reflected by the weighting technique included in the standards as an alternative evaluation method.

10. **Acclimatization in a hot, humid environment: energy exchange, body temperature, and sweating.** D. MITCHELL, LC SENAY, CH WYNDHAM, AJ VAN RENSBURG, GG ROGERS and NB STRYDOM. *Journal of Applied Physiology*, Vol 40, May 1976, P. 769 - 778, 47 Refs.

Four trained young men worked for 4 h/day at 40-50% of their maximum aerobic capacity for 3 days at 25°C db, 18°C wb and then for 10 consecutive days at 45°C db and 32°C wb. Their thermal status was assessed using direct calorimetry. As a group, the men showed classical acclimatization responses, but there were marked individual differences. The calorimetric analysis revealed that reductions in strain were associated with minor changes in heat balance confined to the first and last hours of exposure. Events occurring within the first 4 days appeared to have little effect on body temperatures. Significant decreases in body temperature took place only when sweat and evaporation rate increased. A 10% increase in evaporation rate was accompanied by a 30% increase in sweat rate and a 200% increase in unevaporated sweat; thus, there is a wasteful overproduction of sweat. By the 10th day skin temperature was confined to the level necessary to evaporate sufficient sweat to achieve thermal balance with a fully wet body surface. The efficiency of heat transport within the body did not change with acclimatization.

11. **Acclimatization in a hot, humid environment: cardiovascular adjustments.** CH WYNDHAM, GG ROGERS, LC SENAY and D MITCHELL. *Journal of Applied Physiology*, Vol. 40, May 1976 P.779 - 785, Refs. 17.

Four trained young men worked for 4 h/day at 40-50% of their maximum aerobic capacity, first for 3 days at 25°C db, 18°C wb. and then for 10 consecutive days at 45°C db, 32°C wb. This portion of the study was mainly concerned with central circulatory changes during acclimatization. The central circulatory adaptation to work in heat could be divided into four distinct phases: phase 1 (day 1) was characterized by a progressive fall in stroke volume (SV) during heat exposure but cardiac output (CO) was maintained above control values by high

heart rates. Phase II (days 2 and 3) was marked by increases in SV and decreases in heart rate but with little change in CO from phase I. During phase III (days 4-8 of acclimatization), CO increased due to increase in SV. Phase IV (days 6-8) was associated with decreases in rectal and skin temperature towards control levels. SV and HR both decline in this phase so that CO was not elevated greatly above control levels. The results indicated that central circulatory and temperature regulating events are not causally associated in acclimatization.

12. **Acclimatization in a hot, humid environment, body fluid adjustments.** LC SENAY, D MITCHELL and CH WYNDHAM, *Journal of Applied Physiology*, Vol. 40, May 1976, P. 786-796, 18 Refs.

Four trained men worked 4 h/day at 40-50% of their maximum aerobic capacity first for 3 days at 25°C db, 18°C wb and then for ten consecutive days at 45°C db, 32°C wb. Between days 1 and 2 of heat exposure mean total circulating protein (TCP) and plasma volume (PV) increased 11.6% and 9%, respectively. Pre-exposure TCP and PV increased until day 6 of heat exposure. Of the protein fractions, globulins underwent the largest relative increase. During work, movement of protein into and out of the vascular compartment was similar in control and acclimatizing subjects but the latter generally maintained a greater amount of protein and fluid within the vascular volume. There was no evidence of salt and water retention. The increase in vascular volume was ascribed to transfer of interstitial protein and water to the vascular volume. Regression coefficients indicated significant correlations for changes in plasma volume versus heart rate, stroke volume, and cardiac output during acclimatization. It was concluded that the most critical event in heat acclimatization is the expansion of the plasma volume.

III. EXERCISE PHYSIOLOGY

13. **Cardiorespiratory deconditioning with static and dynamic leg exercise during bed rest.** RW STREMEL, VA CONVERTINO, EM BERNAUER and JE GREENLEAF, *Journal of Applied Physiology*, Vol. 41, Dec. 1976, P. 905-909, 31 Refs.

Bed rest deconditioning was assessed in seven healthy men (19-22 yr) following three 14-day periods of controlled activity during recumbency by measuring submaximal and maximal oxygen uptake

(VO₂), ventilation (VE), heart rate, and plasma volume. Exercise regimens were performed in the supine position and included a) two 30-min periods daily of intermittent static exercise at 21% of maximal leg extension force, and b) two 30-min periods of dynamic bicycle ergometer exercise daily at 68% of VO_{2 max}. No prescribed exercise was performed during the third bed rest period. Compared with their respective pre-bed rest control values, VO_{2 max} decreased (P 0.05) under all exercise conditions; -12.3% with no exercise, -9.2% with dynamic exercise, but only -4.8% with static exercise. Maximal heart rate was increased by 3.3% to 4.9% (P 0.05) under the three exercise conditions, while plasma volume decreased (P 0.05) -15.1% with no exercise -10.1% with static, but only -7.8% (NS) with dynamic exercise. Since neither the static nor dynamic exercise training regimes minimize the changes in all the variables studied, some combination of these two types of exercise may be necessary for maximum protection from the effects of the bed rest deconditioning.

IV. CIRCADIAN RHYTHM

14. **Psychomotor test performance and sleep patterns of aircrew flying transmeridional routes.** LESLIE BUCK, *Aviation Space and Environmental Medicine*, Vol. 47, Sept. 1976, P. 979-986, 17 Refs.

Pilots and flight attendants flying scheduled services between Vancouver and Tokyo and between Toronto and Rome were tested on a tracking task before and after flights in each direction. Flights were included in schedules involving both 24-h and 7-d layovers at the overseas station. During these periods, they recorded their sleep patterns. The data showed that, following flight, subjects made an immediate attempt to adapt their behaviour to local time and the changes in their performance scores could be interpreted on that basis. It was concluded that behavioural circadian rhythms adapt rapidly to a new time zone.

V. CLINICAL AVIATION MEDICINE

15. **Acquired bundle branch block and its response to exercise testing in asymptomatic aircrewman: A review with case reports.** JAMES E WHINERY and VICTOR FROELICHER, Jr., *Aviation Space and Environmental Medicine*, Vol. 47, Nov. 1976, P. 1217-1225, 88 Refs.

Performing serial electrocardiograms on apparently healthy populations will detect individuals

with serious electrocardiographic abnormalities. The importance of this screening technique is emphasized by the fact that almost one-half the myocardial infarctions that occur are silent. These electrocardiographic abnormalities may be the first signs of other types of diseases as well. However, the sensitivity and specificity of this screening technique has yet to be established by adequate followup studies. Bundle branch block can be the first sign of heart disease in asymptomatic men, but it usually is not associated with sudden incapacitation. We feel that individuals with bundle branch block should have heart disease ruled out by a thorough cardiovascular evaluation, including cardiac catheterization if necessary, and should be followed for changes in their health status. Exercise testing is an excellent screening technique for CAD. It has an approximate sensitivity and specificity of 60% and 90% respectively. The problems related to the high false positive rate in populations with a low prevalence of CAD must be considered. Exercise testing does not appear to have any value in screening individuals with left bundle branch block for CAD, but may be helpful in individuals with right bundle branch block.

16. **Changing attitudes to the management of severe head injuries.** WALPOLE LEWIN, *British Medical Journal*, Vol. 2, 20 Nov. 1976, P. 1234-1239, 26 Refs.

I have tried to show the dynamic nature of acute head injury, to describe some of the many problems that confront us, and to indicate the newer methods of investigation and treatment that should enable us to prevent the development of some complications and to correct others. The long-term follow-up of many patients with severe head injuries justifies this course and does not allow us to conclude that we have reached the limit in the management of these patients. Many of the advances will come from the meld of the basic disciplines of physiological experiment, pathology, and clinical observation. We recall today that these same disciplines were embodied with such success in one man when he was physician superintendent to the Brown Institute 90 years ago, and who is still remembered in the hot sun of Amara.

17. **Nystagmus, turning sensations, and illusory movement in motion sickness susceptibility.** J. MICHAEL LENTZ, *Aviation Space and Envi-*

ronmental Medicine, Vol. 47, Sept, 1976, P. 931-936, 27 Refs.

The relationships of motion sickness susceptibility to Nystagmic eye movements, sensations of turning, and duration of the spiral after effect were determined with 48 subjects separated into groups on the basis of sex and extremes of motion sickness susceptibility. When subjective alertness levels were controlled, there was no enhancement of elicited nystagmus nor turning sensations in susceptible individuals. However, spiral after effect durations were significantly longer in susceptible individuals than in nonsusceptible individuals. The results are interpreted as favoring Graybiel's model of the structural elements in motion sickness.

VI. SPACE MEDICINE

18. **Behavioural control as a tool in evaluating the functional state of cosmonauts in flight.** OG GAZENKO, VI MYASNIKOV and FN US KOV, *Aviation Space and Environmental Medicine*, Vol. 47, Nov. 1976, P. 1226-1227, 5 Refs.

The present paper deals with an important problem of space medicine—control of the health of cosmonauts in flight based on their behaviour. The paper discusses communication in space time dialogue as the most promising method from the diagnostic point of view. Using a flight of the Soyuz spacecraft by way of illustration the diagnostic importance of spatial-time characteristics of the dialogue is shown.

19. **Effect of space flight factors on the Mammal: Experimental-Morphological study.** V V PORTUGALOV, E A SAVINA, A S KAPLANSKY, V I YAKOVLEVA, G I PLAKHUTA-PLAKUTINA, A S PANKOVA, P I KATUNYAN, M G SHUBICH and S A BUVAILO. *Aviation Space and Environmental Medicine*, Vol. 47, Aug. 1976, Pg. 813-816, 17 Refs.

On the basis of a morphological examination of 27 rats that made a space flight and were sacrificed on the 1st-2nd and 26-27th days post flight, it has been shown that the 22-d space flight has produced no significant changes in the structural organisation of vital organs of the animals. However, a space flight exposure is not indifferent for animals

and leads to the development of morphologically visible changes in individual organs and systems (musculo-skeletal system, hemopoietic organs, hypothalamic-pituitary-adrenal system, renal juxtaglomerular system). The detected changes are reversible, nonspecific, and develop in animals exposed to ground-based hypokinetic and other stress experiments.

VII. HUMAN ENGINEERING

20. **Optimization of crew effectiveness in future cockpit design: Biochemical implications.** SIEGFRIED J. GERATHEWOHL, *Aviation Space and Environmental Medicine*, Vol. 47, Nov. 1976, P. 1182. 15 Refs.

The introduction of new and advanced avionics into the cockpit of future aircraft poses some serious questions about the ability of the pilot to cope with the demands by these systems. Specifically, the electronically integrated display/control systems are characterized by the presentation of digital data requiring a distinct conversion from the analog to the digital display symbology. It is anticipated that such cockpit changes will drastically affect the demands upon and the performance of pilots and crews. There may be an extreme emphasis on certain mental or cognitive functions necessary to work within a highly synthetic environment, which is characterized by the pilot's loss of contact with the real world, of direct contact with the flying machine, of impoverishment of perceptual input, and of a split in man-machine function and responsibility. Research and measures in the areas of selection, training, and care of the pilot of the advanced aircraft and weapon systems are indicated.

21. **Visual elements in flight simulation.** JOHN LOTT BROWN, *Aviation Space and Environmental Medicine*, Vol. 47 Sept. 1976, P. 913-924, 20 Refs.

Flight simulators have been in use for many years and their value has been amply proven. Many of today's simulators are very expensive, but they can pay for themselves by decreasing cost and increasing safety in training pilots to fly complex and expensive modern aircraft. Some aspects of aircraft control depend on an exterior view from the aircraft to the outside visual world. Training

in these aspects of flight in a simulator requires simulation of the visual world to the extent that cues derived from it need to be employed by the pilot. A number of maneuvers cannot be performed without direct visual contact under normal circumstances in commercial as well as in military aviation. The importance of including a simulation of the external world is now acknowledged. Unfortunately, there is currently no solid scientific basis for cataloging visual cues with respect to their importance in aircraft control. This report recommends research topics, techniques and strategies that should receive more attention.

VIII. PROTECTIVE FLYING CLOTHING

22. **Identification of an apprehension effect on physiological indices of thermal strain.** MH HARRISON and C SAXTON, *Aviation Space and Environmental Medicine*, Vol. 47, Sept. 1976, P. 950 - 953, 9 Refs.

A laboratory assessment of the thermal strain produced by wearing a protective clothing assembly, in addition to a normal flying clothing assembly, in a hot environment is described. In addition to the demonstration of an increase in thermal strain when wearing the protective clothing, two points of importance emerged. First, condition replication revealed a significant apprehension effect which confounded the physiological variables used to evaluate the thermal strain, leading to an over-estimation of the severity of that strain. Second, there was a large between-subject variation amongst the eight subjects used, which made the arithmetic mean a potentially misleading statistic for evaluating the increased physiological strain caused by the additional clothing assembly during the heat exposure. The practical implications of these observations are discussed.

23. **Effectiveness of four water-cooled undergarments and a water-cooled cap in reducing heat stress.** GEORGE F. FONSEGA, *Aviation Space and Environmental Medicine*, Vol. 47, Nov. 1976, P. 1159-1164, 10 Refs.

The cooling provided by four different water-cooled undergarments was directly measured on a heated copper manikin dressed in a basic hot-weather flight assembly. This cooling, which represents absorption of the heat produced by the metabolic processes of the body plus that from the ambient

environment in the cabin, was found to be almost directly proportional to the difference between the manikin skin temperature and the temperature of the cooling water at the inlet to a water-cooled undergarment. Although these cooling garments did not, by themselves, completely isolate the manikin surface against heat gain from the hot environment, they did remove about one-half of the potential for heat gain from the ambient environment before the heat reached the manikin surface. The water-cooled cap removed heat from the manikin equivalent to about one-third of the total metabolic heat production of a seated person.

24. Effect on sequential anti-G suit inflation on pulmonary capillary blood flow in man. RAYMOND BEGIN, RICHARD DOUGHERTY, EDWARD D. MICHAELSON and MARVIN A. SACHER, *Aviation Space and Environmental Medicine*, Vol. 47, Sept. 1976, P. 937-941, 18 Refs.

The hemodynamic effects of an anti-G suit, sequentially, filled from below upwards (M-aG) were compared to those of the standard USAF anti-G suit (S-aG) in 10 men supine and under $+G_z$ stress produced by 90° head up passive tilt. S-aG was found to fill from the abdominal bladder downwards. The heart rate and the pulmonary capillary blood flow (Q_c), as estimated by a nitrous oxide plethysmographic method, were used as criteria of effectiveness. Heart rate did not vary between the suits during the supine and upright studies. In the supine position, the first M-aG inflation induced a significant increase of Q_c , 2.5 l min above the Q_c of the S-aG inflation. After 90° head up tilt, M-aG inflation as associated with a significant increase of Q_c , 1.7 l min greater than the Q_c produced by S-aG inflation. Since leg bladder inflation may play a critical role in high-G tolerance, the sequential filling from below upward of the anti-G suit may further increase the G protection compared to the standard garment. In addition, the modified anti-G suit may be a useful device for treatment of circulatory shock and postural hypotension when the venous return is decreased.

25. Non-fatal injuries sustained by seatbelt wearers: a comparative study. M S CHRISTIAN, *British Medical Journal*, Vol. 2, 27 Nov. 1976, P. 1310-1311, 15 Refs.

The injuries sustained by 969 drivers and front-seat passengers in road-traffic accidents were studied. Altogether 196 (20.2%) of the drivers and passengers were wearing seat belts and 773 (79.8%) were not. The injuries among the two groups differed greatly in both severity and distribution. A total of 54 (27.6%) of the seatbelt wearers sustained one or more fractures compared with 300 (38.8%) of the non-wearers, and 18 (9.2%) of the seat belt wearers were severely injured compared with 300 (38.8%) of the non-wearers. Soft-tissue injuries to the face were sustained by only 29 (14.8%) of the seatbelt wearers compared with 425 (55%) of the non-wearers.

Since wearing seatbelts may become compulsory, the type and pattern of injuries to be expected in wearers should be appreciated.

IX. UNDER WATER MEDICINE

26. What EEG criteria for diving fitness? J. CORRIOL, JJ PAPY, M. JACQUIN and F. BLANQUET. *Aviation Space and Environmental Medicine*, Vol. 47, Aug 1976, P. 868-872, 16 Refs.

The authors have tried to consider EEG criteria applicable to fitness for diving. In a study of 90 professional divers, 37 (41%) displayed patterns susceptible of being interpreted as falling outside of strict normalcy. These patterns have sometimes been considered incompatible with diving, or even pathological by some authors. Considering the fact that these subjects were in good health, the value of these EEG signs is discussed in comparison with the literature. A general guideline is proposed placing subjects in three groups: fit, unfit and questionable. In the last case, a final decision is taken in each individual case in agreement with the other medical examination and based on the type of diving being considered. Some explicit EEG criteria of definitive or temporary fitness and unfitness are proposed.